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ELECTRICALLY HEATED ROTARY BAKER'S OVEN

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(57) Claim

1. A heating element assembly for a baker's oven including:

a substantially channel section element support plate having an elongate recess in the underside (preferably centrally) of a web portion of the support plate;

an elongate heating element portion received within the recess;

plate means to secure the element portion in the recess; and

electrical connection means for the element portion.

8. A steaming assembly for a baker's oven including:

at least one water pipe mounted in a channel-section element support plate for an electrical heating element;

an elongate heating element portion being

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received within an elongate recess in the underside of the support plate:

at least one water nozzle in the pipe directed into the interior of the support plate;

diffuser plate means mounted on the support plate above the water pipe;

a source of water for the water pipe; and

control means to control the flow of water through the pipe to generate steam.

11. A control system for a baker's oven of the type having a baking compartment provided with a bottom heating element assembly provided with a steaming system, a top heating element assembly (and optionally, a mid-compartment heating element assembly), so arranged that during the operation of the steaming system, the top (and optional mid-compartment) heating element assemblies are switched off, the bottom heating assembly remaining switched on.

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Invention Title : "ELECTRICALLY HEATED ROTARY BAKER'S OVEN"

Details of Associated Provisional Applications -

Numbers : PL2199

The following statement is a full description of the invention including the best method of performing it known to me.

THIS INVENTION relates to an electrically heated rotary baker's oven.

A well-known and widely used baker's oven has a number of superimposed oven compartments with individual oven doors at the front. A vertical drive shaft driven by an electric motor passes through all of the compartments. In each compartment, a sleeve is mounted on, and frictionally driven by, the shaft. Fixed on each sleeve are two carrier frames, one spaced above the other, each frame carrying two grid supports, to opposite sides of the sleeve. Each support is capable of receiving through the opened oven door of the compartment, and when the carrier frames and sleeve have been brought temporarily to rest, two adjacent assemblies, each of three bread baking tins. Four such assemblies, or twelve of the baking tins, may thus be loaded on to the two carrier frames, and after the carrier frames have been permitted to turn through 180°, a further four assemblies of the baking tins may be loaded similarly.

Bakery goods other than those in bread baking tins may, of course, be loaded into the oven in this way. When the baking has been completed, the baked articles may be easily and quickly unloaded.

The oven compartment is heated by electric heating elements of rod type, each shaped to form an elongated U, the parallel arms of which extend across the oven. One series of elements is at the bottom of the compartment, another at the top, the parallel arms of each element being housed in channels formed in the bottom and top plates of the oven compartment. A third set of heating elements is supported between the two carriers.

Although ovens of this type have been found to be very effective and generally satisfactory, a number of problems do arise.

In the known ovens, spiral electrical heating elements are used to ensure even heating within the baker's compartments, to prevent local "hot-spots". These heating elements have proved difficult to clean around.

Steaming of the bakery products is another problem area. The water sprayed into the baking compartments, to form the steam, may strike the bakery products and damage the surface of same. The spray nozzles may clog due to the combination of heat and hard water. More importantly the introduction of steam may cause the baking compartments to undergo uneven variations in temperature, resulting in uneven baking of the products.

It is an object of the present invention to provide a heating element for a baker's oven which is easily cleaned. It is a preferred object to provide such an element which has good heat dissipation characteristics.

It is a further preferred object to provide such an element in combination with a steaming unit which prevents water striking the product.

It is a still further preferred object to provide a steaming system where the temperature is evenly maintained in the bakery compartments during the steaming step.

It is a still further preferred object to provide an improved steaming control system.

Other preferred objects will become apparent from the following description.

In one aspect, the present invention resides in a heating element assembly for a baker's oven including:

a substantially channel section element support plate having an elongate recess in the underside (preferably centrally) of a web portion of the support

plate;

an elongate heating element portion received within the recess;

plate means to secure the element portion in the recess; and

electrical connection means for the element portion.

In a second aspect, the present invention resides in a heating element assembly for a baker's oven, including:

a substantially S-section element support plate having a downwardly-directed recess or mouth;

an elongate heating element portion received within the recess; and

electrical connection means for the element portion.

In a third aspect, the present invention resides in a heating element assembly comprising a pair of the heating element assemblies mounted side-by-side, the heating element portion being interconnected to form a substantially U-shaped heating element member.

Preferably the side flanges of the element support plates are provided with slots to receive and support water pipes for a steaming system, preferably transversely to the element portions.

Diffuser plates overlie the water pipes, the latter having nozzles directed into the interior of the element support plates. Alternatively, ballast bars or plates may be provided in the interior of the channel section element support plates, on the upwardly-directed recesses or mouths of S-section elements, and the nozzles of the water pipes are directed thereto.

Preferably the heating assemblies are mounted asymmetrically in the baking compartments to ensure even heating of the product.

In a fourth aspect, the present invention

resides in a steaming assembly for a baker's oven including:

at least one water pipe mounted in a channel-section element support plate for an electrical heating element;

an elongate heating element portion being received within an elongate recess in the underside of the support plate;

at least one water nozzle in the pipe directed into the interior of the support plate;

diffuser plate means mounted on the support plate above the water pipe;

a source of water for the water pipe; and

control means to control the flow of water through the pipe to generate steam.

In a fifth aspect, the present invention resides in a steaming assembly for a baker's oven including:

at least one water pipe mounted in an inwardly-directed recess in a substantially S-section element support plate for an electrical heating element;

an elongate heating element portion being received in a downwardly-directed recess in the support plate;

at least one water nozzle in the pipe directed into the upwardly-directed recess of the support plate;

ballast means in the upwardly-directed recess below the water nozzle; and

a source of water for the pipe; and

control means to control the flow of water through its pipe to generate steam.

Preferably the control means allows the water to flow from the nozzles in short, predetermined bursts, with predetermined pauses therebetween.

In a sixth aspect, the present invention

resides in a control system for a baker's oven of the type having a baking compartment provided with a bottom heating element assembly provided with a steaming system, a top heating element assembly (and optionally, a mid-compartment heating element assembly), so arranged that during the operation of the steaming system, the top (and optional mid-compartment) heating element assemblies are switched off, the bottom heating assembly remaining switched on.

Preferably the control system allows the introduction of water for one or more preset periods, the periods being separated by periods in which the water supply is stopped. For example, the steaming cycle may be 1 second steam, 10 seconds pause, 1 second steam, 10 seconds pause, 1 second steam. During this cycle, the top (and mid-) elements are switched off.

Preferably the control system incorporates a programmable micro-processor.

To enable the invention to be fully understood, preferred embodiments will now be described with reference to the accompanying drawings, in which:

FIG 1 is a schematic sectional view of a side-by-side rotary oven;

FIG 2 is a schematic view of the layout of the bottom heating elements in a baking compartment;

FIG 3 is a plan view of one of the elements in accordance with the present invention; and

FIG 4 is a sectional end view taken on line 4-4 in FIG 3; and

FIG 5 is a sectional end view, similar to that of FIG 5, of an alternative element.

Referring to FIG 1, the oven 10 has a plurality of baking compartments 11 arranged vertically in side-by-side pairs 11A,11B.

Each oven compartment 11 is substantially octagonal in shape, with insulated walls 12 and an oven

door 13 at the front for access to the compartments.

As shown in FIG 2, a pair of tray holders 14,15 are mounted on a vertical shaft 16 via a clutch (or step) mechanism which enables the rotation of the tray holders 14,15 to be stopped for loading and unloading of trays (bearing bakery products).

Electrical heating element assemblies to be hereinafter described, are provided at the bottom and top of the compartments 11, a middle element assembly may be provided in split level compartments, interposed below an upper pair of tray holders 14,15.

In the embodiment shown in FIG 1, the chamber shape, location of holes for the element assemblies 17, and the oven doors 13 for the compartments 11A,11B are identical to reduce manufacturing costs.

It will also be noted that the element assemblies 17 are arranged asymmetrically in each compartment 11 to reduce the likelihood of local "hot-spots" in the compartments, for more even heating of the compartment and the products therein.

The controls 18 for the element assemblies 4, and the steaming system to be hereinafter described, are provided at the front of the oven 10.

Referring now to FIGS 3 and 4, the heating element assembly 17 has a substantially U-shaped electrical heating element 20 with parallel side arms 21,22 interconnected by an end portion 23. The free ends of the arms 21,22 are provided with electrical contacts 24 and mounting nuts 25 and for electrical connection.

Each side arm 21,22 is received within an elongate recess formed in the web 26 of a channel section element support plate 27 and is secured by a bottom plate 28. The support plates 27 are interconnected by brackets 29,30 and are closed by respective end plates 31,32 to form trough-like

structures.

For the steaming system 33, which is only provided for the bottom heating element assemblies 17, a water pipe 34 is supported in aligned slots in the side flanges 35,36 of the support plates 27 and are retained therein by diffuser plates 37 (one of which is shown in side elevation in FIG 3) and locking pins 38. The pipe 34 has pairs of nozzles directed downwardly into the interior of the channel section support plates 27.

The element support plates 27 can be easily cleaned using a scraper profiled to complement the profile of the webs 26 of the support plates.

The support plates 27 (and bottom plates 28) provide a large heat sink for the injected water and it is rapidly converted to steam.

The water will flow along the plates as it is converted to steam and the diffuser plates 37 prevent the water from being reflected upwardly onto the product being baked.

As the majority of the elements 20 are encapsulated by the support plates 27 and bottom plates 28, the likelihood of physical damage during cleaning is reduced.

Referring to FIG 5, the alternative support plates 127 are of modified S-Section (with the 'S' laid on its side) and are interconnected by brackets 129. The side arms 121, 122 of the heating elements 120 are received in downwardly directed recesses 127A in the support plates 127, while the water pipes 134 have their nozzles 134A directed downwardly towards the steel ballast bars 140 received within the upwardly-directed recesses 127B in the support plates 127.

The steel ballast bars 140 (eg. of 25mm x 6mm steel) provide heat sinks to rapidly convert the water to steam (with little temperature loss) and displace the water to prevent puddling in the support plates 127.

For most efficient steaming of the product, the product is steamed as soon as possible after it has been placed in the compartment 11 and the door 13 has been closed.

A microprocessor, included in the controls 18, controls the steaming regime as well as the temperature and time parameters set by the baker. It is important to remember that the steam is generated at the bottom elements only in each compartment whether of standard or split-deck type.

Each press of the steam button on the controls 18 may be set to provide 1 second of water injection, followed by a 10 second pause.

In conjunction with the steam production, which has a cooling effect on the bottom heating elements, the top (and middle) elements are switched off for eg. a minute per press of the steam button to compensate for the heat loss at the bottom of the compartment.

This switching off of the "non-steam generating" top (and middle) elements for a period corresponding to the steam generation period ensures that the product is cooked evenly from above and below.

If the steam button was pressed three times, the steam cycle would be (i) 1 second water injection; (ii) 10 seconds pause; (iii) 1 second water injection (iv) 10 seconds pause; and (v) 1 second water injection. The top (and middle) elements are switched off for 3 minutes from the time of the first injection, the bottom element remaining switched on.

Advantages of the oven of the present invention include:

(a) "softer" heating of the product due to the larger radiant area of the elements;

(b) the elements are easily cleaned and the electrical elements are protected from physical damage

during cleaning;

(c) "live" steam is generated quickly without liquid water being sprayed directly onto the product;

(d) fast recovery of oven temperatures during and after steaming;

(e) even heat throughout the compartments during steaming;

(f) the element assemblies are inexpensive to produce and may be disposable;

(g) the need for a separate steam generator is obviated; and

(h) the invention is applicable to both standard and split-deck compartments.

Various changes and modifications may be made to the embodiments described and illustrated without departing from the present invention.

DATED this twenty-ninth day of April 1993.

APV BAKER PTY LTD

By their Patent Attorneys,

GRANT ADAMS & COMPANY.

The claims defining the invention are as follows:

1. A heating element assembly for a baker's oven including:

a substantially channel section element support plate having an elongate recess in the underside (preferably centrally) of a web portion of the support plate;

an elongate heating element portion received within the recess;

plate means to secure the element portion in the recess; and

electrical connection means for the element portion.

2. A heating element assembly for a baker's oven, including:

a substantially S-section element support plate having a downwardly-directed recess or mouth;

an elongate heating element portion received within the recess; and

electrical connection means for the element portion.

3. A heating element assembly comprising a pair of the heating element assemblies, as claimed in Claim 1 or Claim 2, mounted side-by-side, the heating element portions being interconnected to form a substantially U-shaped heating element member.

4. A heating element assembly as claimed in any one of Claims 1 to 3 wherein:

side flanges of the support plates are provided with slots to receive and support water pipes, for a steaming system, substantially transversely to the element portions.

5. An assembly according to Claim 4 wherein:

diffuser plates overlie the water pipes, the water pipes having nozzles directed into the interior of the element support plates.

6. An assembly according to Claim 4 wherein:

ballast plates or bars are provided in the interior of the channel-section support plates or in the upwardly-directed recesses in the S-section support plates below the water pipes, the water pipes having nozzles directed towards the ballast plates or bars.

7. A baker's oven wherein the heating assemblies as claimed in any one of Claims 1 to 6 are mounted asymetrically in the bakery compartments thereof to ensure even heating of products in the bakery compartments.

8. A steaming assembly for a baker's oven including:

at least one water pipe mounted in a channel-section element support plate for an electrical heating element;

an elongate heating element portion being received within an elongate recess in the underside of the support plate;

at least one water nozzle in the pipe directed into the interior of the support plate;

diffuser plate means mounted on the support plate above the water pipe;

a source of water for the water pipe; and

control means to control the flow of water through the pipe to generate steam.

9. A steaming assembly for a baker's oven including:

at least one water pipe mounted in an inwardly-directed recess in a substantially S-section element support plate for an electrical heating element;

an elongate heating element portion being received in a downwardly-directed recess in the support plate;

at least one water nozzle in the pipe directed into the upwardly-directed recess of the

support plate;

ballast means in the upwardly-directed recess below the water nozzle; and

a source of water for the pipe; and

control means to control the flow of water through its pipe to generate steam.

10. A steaming assembly as claimed in Claim 8 or Claim 9 wherein:

the control means allows water to flow from the nozzles in short, predetermined bursts, with predetermined pauses therebetween.

11. A control system for a baker's oven of the type having a baking compartment provided with a bottom heating element assembly provided with a steaming system, a top heating element assembly (and optionally, a mid-compartment heating element assembly), so arranged that during the operation of the steaming system, the top (and optional mid-compartment) heating element assemblies are switched off, the bottom heating assembly remaining switched on.

12. A control system as claimed in Claim 11 wherein:

the control system allows the introduction of water for one or more preset periods, the periods being separated by periods in which the water supply is stopped.

13. A heating element assembly for a baker's oven substantially as hereinbefore described with reference to FIG 1 to 4 of the accompanying drawings.

14. A heating element assembly for a baker's oven substantially as hereinbefore described with reference to FIGS 1, 2 and 5 of the accompanying drawings.

DATED this twenty-ninth day of April 1993.

APV BAKER PTY LTD,
By its Patent Attorneys,
GRANT ADAMS & COMPANY.

ABSTRACT

A baker's oven (10) has bakery compartments (11) where the heating elements (20, 120) are arranged asymetrically. The side arms (21, 22, 121, 122) of the heating elements (20, 120) are received in downwardly-directed recesses (127A) in element support plates (27, 127), the latter supporting transverse water pipes (34, 134) with nozzles 134A which spray water into the support plates (27, 127) which convert the water to steam. A steaming control system switches off the top (and mid) elements while the water is injected for steaming in a controlled sequence.

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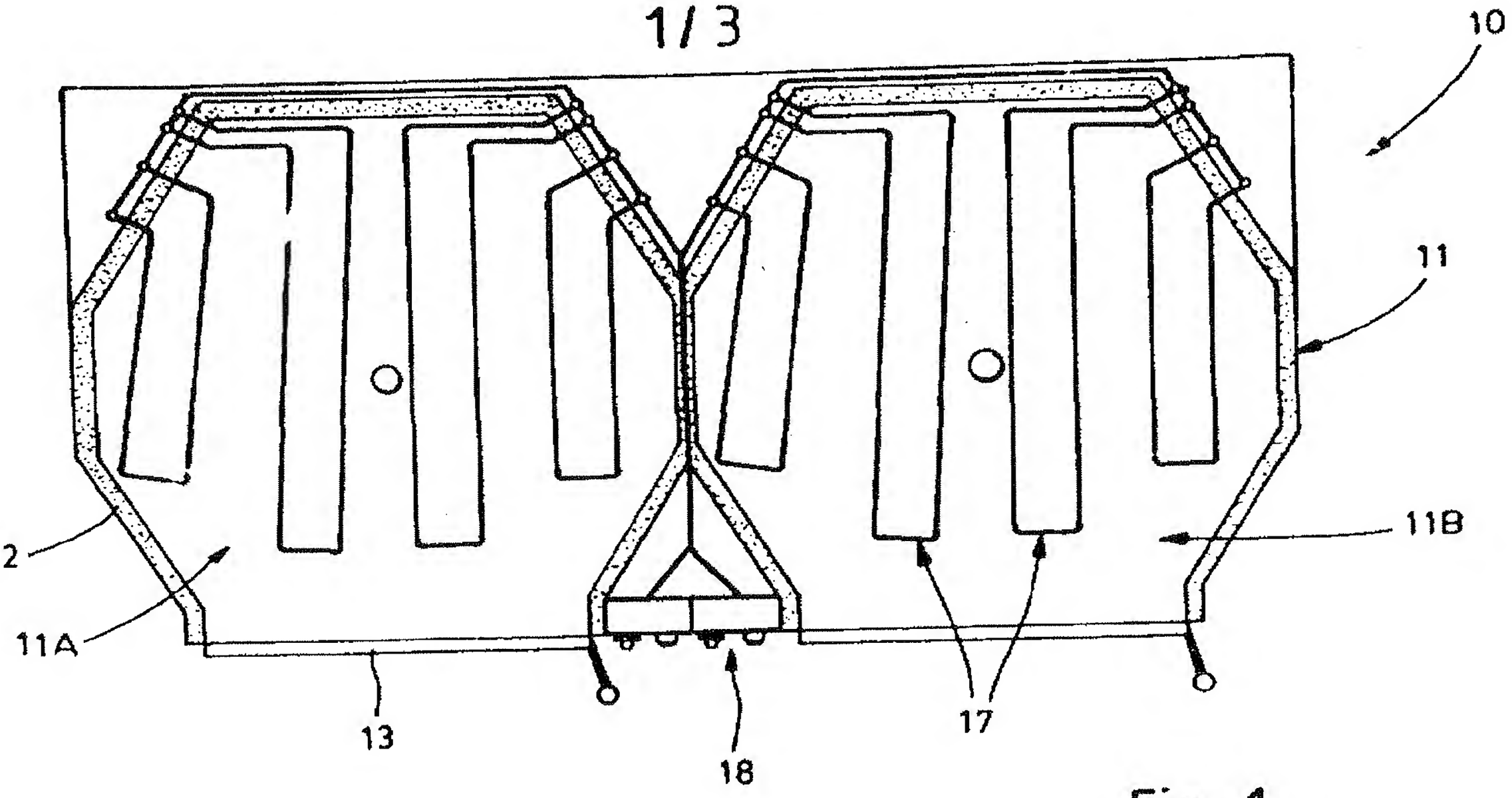

Fig. 1

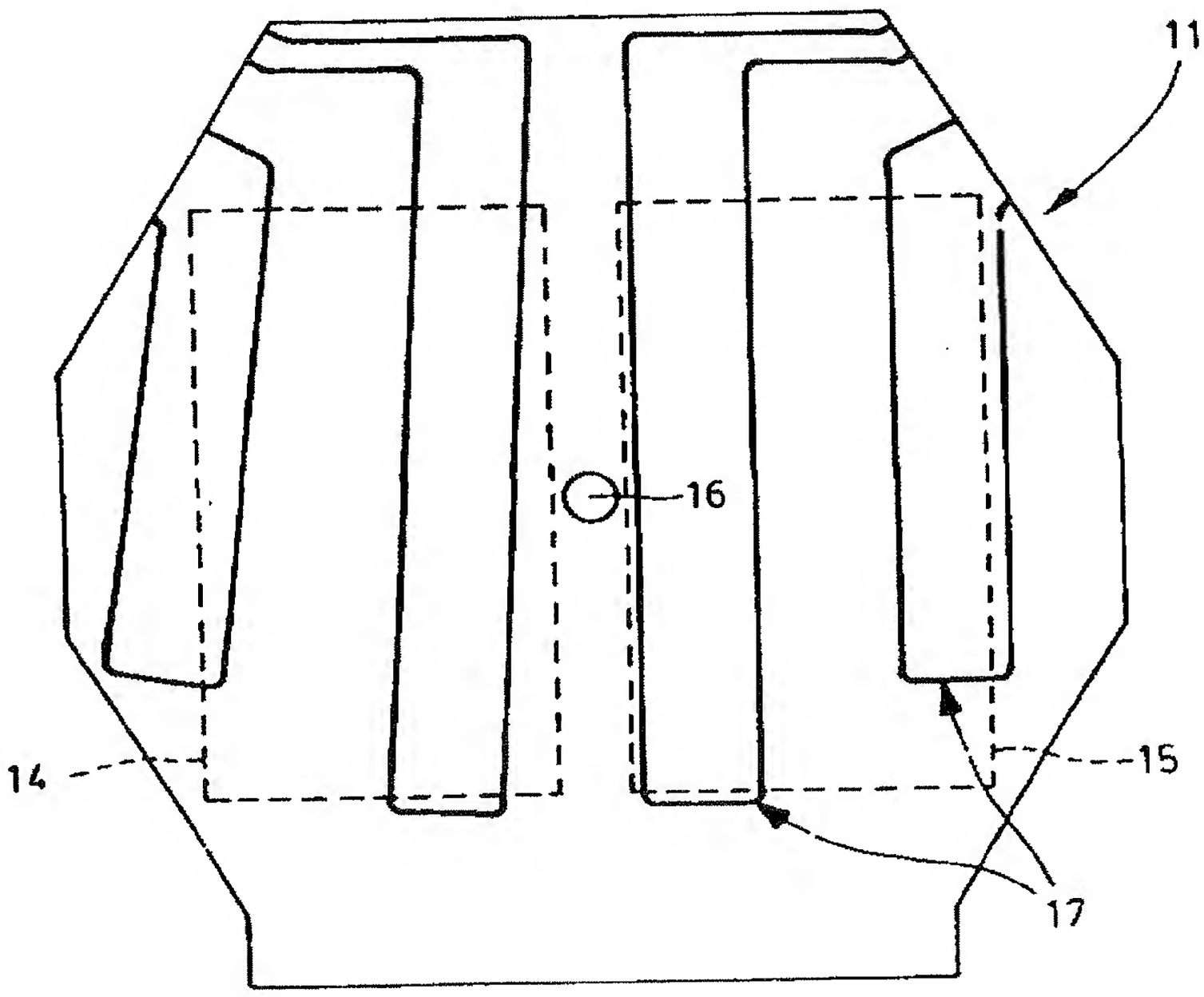

Fig. 2

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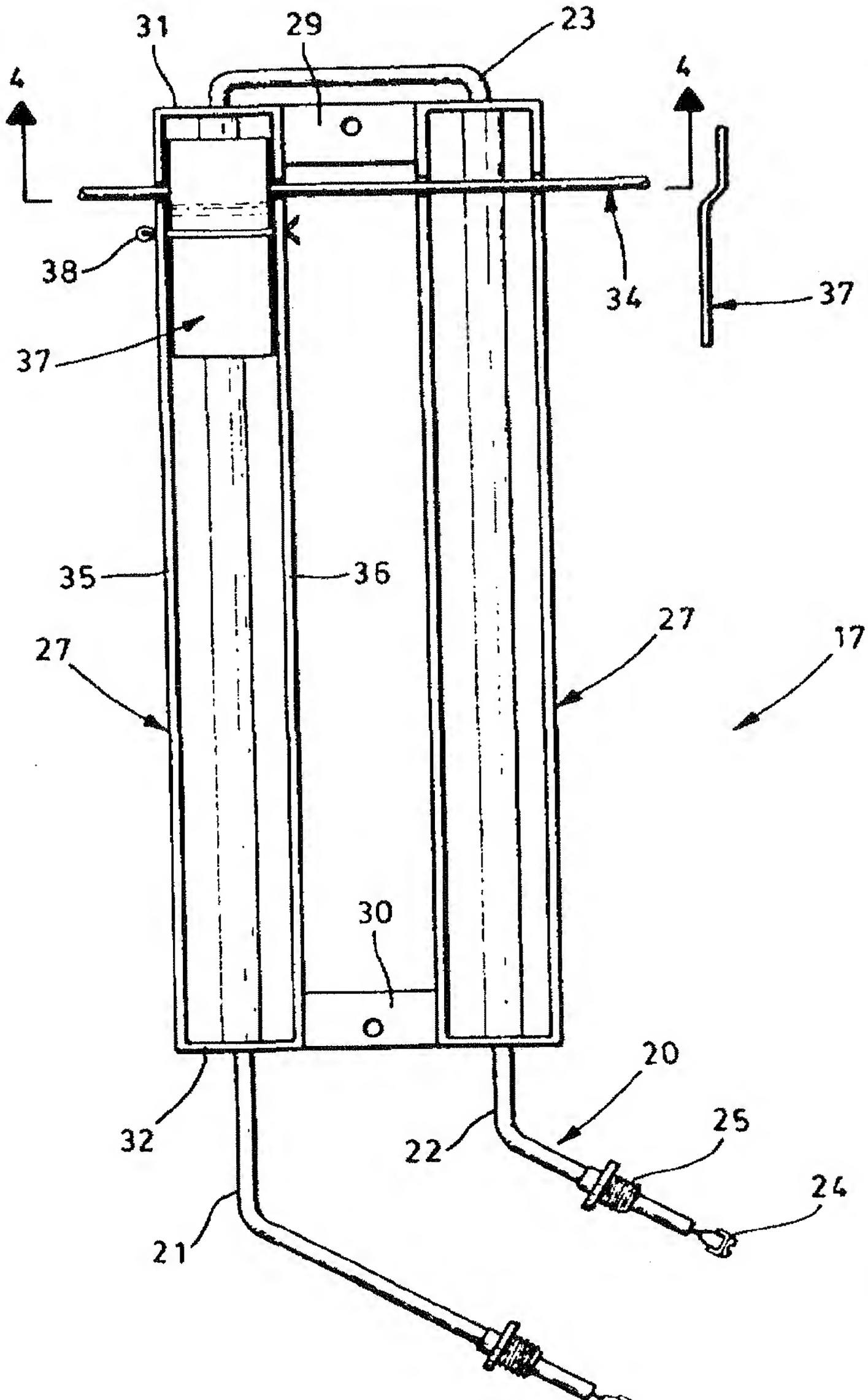

Fig. 3

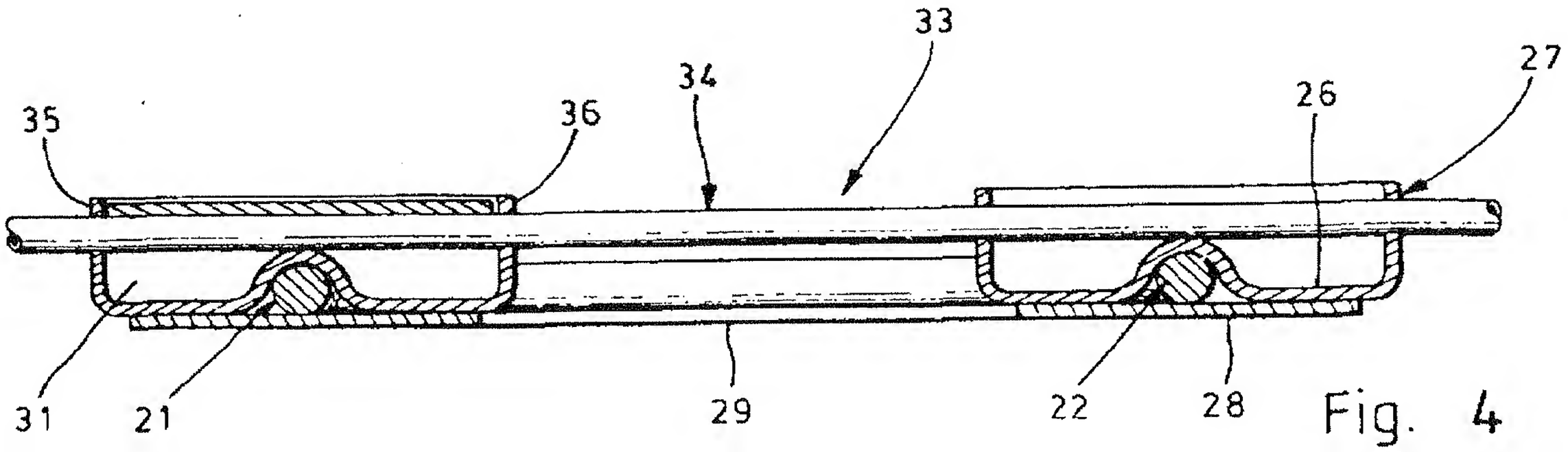

Fig. 4

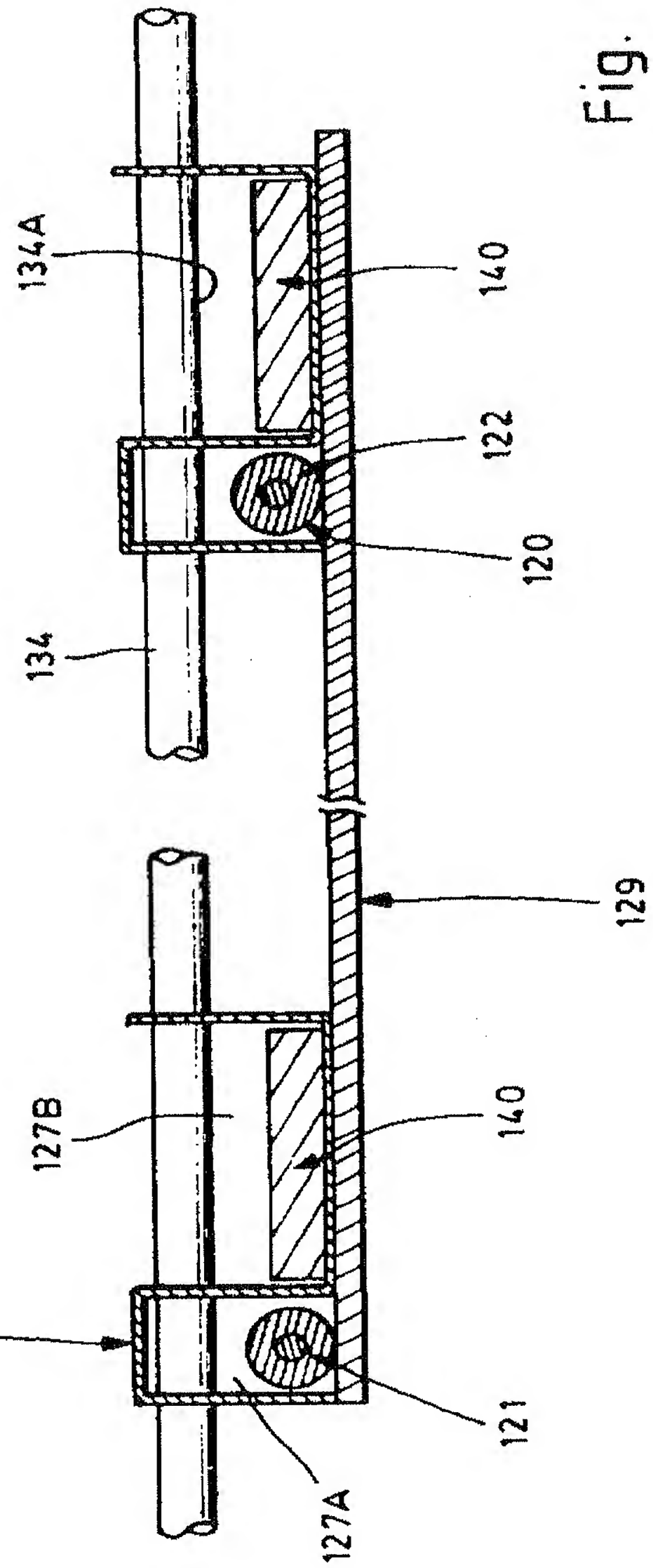

Fig. 5